POST-PASSAGE CONDITION AND GATEWELL RETENTION TIME OF SUBYEARLING AND YEARLING CHINOOK SALMON GUIDED FROM MODIFIED BONNEVILLE DAM SECOND POWERHOUSE TURBINE INTAKES

Lyle G. Gilbreath, Michael H. Gessel, and Dean A. Brege
National Marine Fisheries Service, Northwest Fisheries Science Center, Fish Ecology Division
2725 Montlake Boulevard East, Seattle, Washington 98112-2097
Lyle.Gilbreath@noaa.gov

Dean Ballinger
Pacific States Marine Fisheries Commission
P.O. Box 154, North Bonneville, Washington 98639
Deanb@gorge.net

ABSTRACT

Efforts to improve fish guidance efficiency (FGE) at Bonneville Dam Second Powerhouse have been ongoing since 1983. Between 2001 and spring 2008, all second powerhouse intakes were modified to increase flow into turbine intakes and gatewells, thereby improving FGE. Structural modifications completed during this time included: 1) increasing the length of vertical barrier screens by removing a portion of the concrete beams upon which the screens rest, 2) installation of turning vanes below the STS picking beams, and 3) installation of gap closure devices on the intake ceilings downstream from the top edge of STSs. Prototype modifications were biologically tested in 2001 and 2002. Comparison of FGE between modified and unmodified intakes showed significant FGE increases in modified intakes and fish condition tests showed that mortality and descaling rates were not increased by the modifications.

In 2007, however, peak daily mortalities of 11.7% and 10.1% were observed during March and April passage of tule stock subyearling Chinook salmon released from Spring Creek National Fish Hatchery (NFH). There was no evidence to indicate Second Powerhouse passage facilities were operating out of criteria and no history of disease problems in the 2007 Spring Creek NFH releases. This study was undertaken to determine if passage mortality and adverse fish condition effects are related to turbine operation at higher levels within the 1% peak efficiency range.

At Bonneville Dam Second Powerhouse in 2008, we conducted tests using 32,210 juvenile Chinook salmon obtained from Spring Creek NFH, 1,069 run-of-river (ROR) yearling Chinook salmon, and 2,136 ROR subyearling Chinook salmon. Fish were fin-clipped or PIT-tagged, then released into turbine intakes and gatewells at lower, middle, and upper settings within the 1% peak efficiency range of the turbine units. Test fish were recaptured via 100% sampling (fin-clipped fish) or separation-by-code (PIT-tagged fish) at the juvenile facility.

Release-recapture tests conducted from 4 March to 9 May using subyearling Chinook salmon obtained from Spring Creek NFH consistently showed higher mortality and lower recapture rates as turbine loadings increased within the 1% peak efficiency range. For example, on 4 and 5 March we released fish into the 12A gatewell under three different operational settings. Mortality of fish recaptured averaged 1.6%, 14.3%, and 32.3% for releases at lower, middle, and upper 1% turbine operation, respectively. Recapture rates averaged 98.3% for lower, 94.5% for middle, and 66.6% for upper 1% releases. These and other test results will be discussed during our presentation.